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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,557	11/17/2006	Yasuhiko Kasama	8075-1111	4919

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EXAMINER	
ANGADI, MAKI A	
ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
10/14/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/593,557	KASAMA ET AL.	
	Examiner	Art Unit	
	MAKI A. ANGADI	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 August 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *3-7 and 9-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-7 and 9-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/25/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/7/2009 has been entered.

2. Examiner has entered amendments to the specification and claims filed on 8/7/2009.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 3-6, 9, 12 and 17 are rejected under 35 U.S.C. 103(a) over Miley et al. (US Patent No. 6,171,451) in view of Chang Robert (US Patent No. 5,916,642).

As to claims 3 and 6, Miley discloses a fullerene production method (col.5, lines 6-11) that comprises: generating plasma (Fig.1, col.6, lines 59-60) containing target ions in spherical volume vessel (Fig.1A, col.6, lines 61-62); applying a control voltage (col.6, line 60) to an electric potential body/grid (col.6, line 61-64) in contact with plasma to control density of the target ions (col.7, lines 1-4); irradiating plasma towards deposition assistance substrate and fullerene is deposited at the bottom of the chamber (col.10, lines 15-18) (Fig.2); applying a bias voltage (col.13, lines 52-67, claim 18) of a polarity opposite to that of the target ions with acceleration energies (col.9, lines 65-67, col. 10, lines 1-10); applying bias voltage to provide containment ions and generate material molecules to internally contain target ions (col.14, lines 25-31). It is noted that the lower chamber region serves the role of substrate to collect fullerene.

Miley discloses the presence of ions in the fullerene production unit (col.7, lines 54-60, col.9, lines 65-67) but does not explicitly disclose collision ions. However, Miley's production apparatus discloses an electrical discharge in the hydrocarbon gas resulting in molecules and ionization of component atoms under

grid voltage (col.9, line 57). Therefore, one would expect the generation of collision ions in the production apparatus in addition to target ions are generated in the presence of external voltage.

Miley does not explicitly disclose a method to produce encapsulating-fullerenes or encapsulating-nanotubes. However, Chang discloses a method of encapsulating a material e.g. copper, germanium in a carbon nanotube (col.1, lines 61-67 and col.2, lines 1-5, Fig. 3B and 3C). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to select encapsulating-nanotubes in the process employed by Miley because Chang illustrates in Fig.2B and Fig.2C that the encapsulating-nanotubes with metal or a semiconductor material can be used as electron emitters in flat panel disclpays for visual display devices and nanowires (after nanotube is removed) for electrical interconnects for connecting IC chips (col.6, lines 28-33).

As to claims 4-5, Miley discloses a production apparatus for producing fullerene molecules (Fig.2) (col.5, lines 6-11) by generating plasma (col.6, lines 590-60) on deposition assistance substrate (lower chamber region) by plasma irradiation (col.6, lines 58-65).

As to claim 9, Miley discloses implantation target ions are cesium, argon, hydrogen, helium, nitrogen ions (col.14, lines 48-53).

As to claim 12, Miley discloses that the production method comprises fullerene (col.5, lines 31-35) and collision ions are fullerene positive or negative

ions depending on target substance, propellant gas and applied voltage (Fig.11, col.47-65).

As to claim 17, Miley discloses ion density profiles in Fig.1C and 1D by measuring an electric current flowing between the substrate to measure the density of target ions (col.7, lines 43-61 and col.11, lines 36-57).

Claim Rejections - 35 USC § 103

4. Claims 7, 13-16 are rejected under 35 U.S.C. 103(a) over Miley et al. (US Patent No. 6,171,451) in view of Chang Robert (US Patent No. 5,916,642) as applied to claim 6, and in further view of Fetherston et al. (US Patent No. 5,693,376).

Miley discloses a production apparatus for producing fullerene (Fig.2) comprising a vacuum vessel (111); plasma generation means for generating plasma (col.9, lines 55-57) including generating target ions (col.9, lines 65-67); collision ions (col.11, lines 36-48); a substrate (in the lower chamber region, 125); bias power supply for applying bias voltage from 100V to about -1kV (col.14, lines 64-65) to measure density of target ions (col.13, lines 64-67 and col.14, lines 13-16); electric potential body (or wall structure) in a lattice pattern (Fig.9, lines 24-29); target molecules depositing on the substrate (Fig.6A, col.12, lines 4-23); fullerene ions that would include positive and negative ions because of the electrical potential difference between the wall of the chamber 11 and the grid 112 (col.9, lines 65-67 and col.10 lines 1-10).

Miley is silent about the use of magnetic field generation means. However, Fetherston discloses the use of magnetic bars (13) distributed about the outer periphery of the chamber wall (12) to generated magnetic field to influence ions generated by the plasma (col.5, lines 16-29, Fig.2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ magnetic field lines around the plasma chamber employed by Miely because Fetherston illustrates that the presence of magnetic field will enhance ionization of gas molecules in the production of materiel film (col.5 lines 28-39).

Miley does not explicitly disclose a method to produce encapsulating-fullerenes or encapsulating-nanotubes. However, Chang discloses a method of encapsulating a material e.g. copper, germanium in a carbon nanotube (col.1, lines 61-67 and col.2, lines 1-5, Fig. 3B and 3C). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to select encapsulating-nanotubes in the process employed by Miley because Chang illustrates in Fig.2B and Fig.2C that the encapsulating-nanotubes with metal or a semiconductor material can be used as electron emitters in flat panel displays for visual display devices and nanowires (after nanotube is removed) for electrical interconnects for connecting IC chips (col.6, lines 28-33).

Claim Rejections - 35 USC § 103

5. Claims 10 is rejected under 35 U.S.C. 103(a) over Miley et al. (US Patent No. 6,171,451) in view of Chang Robert (US Patent No. 5,916,642) as applied to claims 3 and 6, in further view of Takehara et al. (US pub. No. 2005/0129607).

Miley is silent about the use of target substance such as TTF, anthracene, pentacene etc. in the production of material film. However, Takehara discloses the use of anthracene, naphthalene and phenanthracene in the production of fullerene (paragraph 0022, 0045). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to select anthracene and other target material in the production of material film because Takehara discloses that the hydrocarbon fuel such as anthracene reacts with oxygen to generate heat, thereby raising a gas temperature to a degree sufficient to produce material film such as fullerene (paragraph 0046).

Claim Rejections - 35 USC § 103

6. Claim 11 is rejected under 35 U.S.C. 103(a) over Miley et al. (US Patent No. 6,171,451) in view of Chang Robert (US Patent No. 5,916,642) as applied to claim 3, in further view of Liu et al. Chemical Physics Letters, 331 (2000), pages 31-34.

Miley is silent about the size of the collision ions in the production of fullerene. However, Liu discloses the size of the collision carbon nanorods or fullerenes in the range 15-50 nm (page 32, paragraph 1) with a mean free path of 15 μm for carbon-carbon collision (page 33, paragraph 4). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention

was made to select the size of the collision ions and hence the size of nanotubes because Liu illustrates in Fig. 1 that the structural characteristics of the ionic collision of carbon ions during discharge process are responsible for building a longer nanotubes.

Response to Arguments

7. Applicant's arguments on pages 10-13 with respect to claims 3-7 and 9-17 have been considered but are moot in view of the new ground(s) of rejection. The new reference of Chang (US Patent No. 5,916,642) discloses a method of encapsulating a material in a carbon nanotube. Therefore, the combined reference of MIley and Chang meet the limitations of amended independent claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Anazawa et al. (US Patent No. 6,902,655) discloses a producing apparatus and production method for manufacturing carbon structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MAKI A. ANGADI whose telephone number is (571)272-8213. The examiner can normally be reached on 8 AM to 4.30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Maki A Angadi/
Examiner, Art Unit 1792

/Shamim Ahmed/
Primary Examiner, Art Unit 1792